GEOLOGICAL AND NATURAL HISTORY SURVEY OF CANADA.
ALFRED R. C. SELWYN, C.M.G., LL.D., F.R.S., DIRECTOR.

REPORT

ON THE

SURFACE GEOLOGY

OF

NORTH-EASTERN NEW BRUNSWICK

TO ACCOMPANY QUARTER-SHEET MAPS 2 N.E. AND 6 S.W.

BY

R. CHALMERS.

PUBLISHED BY AUTHORITY OF PARLIAMENT.

MONTREAL:
DAWSON BROTHERS.
1888.

Alfred R. C. Selwyn, C.M.G., LL.D., F.R.S., Etc.,
Director of the Geological and Natural History Survey of Canada.

Sir,—Herewith I beg to submit to you my report on the surface geology of the district embraced in the two quarter-sheet maps, 2 N. E., and 6 S. W., north-eastern New Brunswick, being the result of a detailed examination of it made during the season of 1886. These sheets, coloured to show the character and distribution of the surface deposits, will accompany this report.

My grateful acknowledgments are due to K. F. Burns, M.P., W. J. O'Brien, Collector of Customs and W. H. Chisholm, Superintendent of the Caraquette Railway, Bathurst; also to Chas. E. Fish and Dr. A. C. Smith, Newcastle, for information and various acts of kindness. The ate G. A. Blair, Chatham, and Miss Andrews, Bathurst, likewise kindly furnished me with lists of barometric readings taken at the meteorological stations under their charge.

I have the honour to be,
Sir,
Your obedient servant,
R. CHALMERS.

Ottawa, April, 1887.

REPORT

ON THE

SURFACE GEOLOGY

OF

NORTH-EASTERN NEW BRUNSWICK,

To Accompany Quarter-sheet Maps 2 N.E. and 6 S.W.

Area explored.

The detailed investigations of the surface geology of New Brunswick were continued during the past season (1886) and the areas embraced in the two quarter-sheet maps, 2 N.E. and 6 S.W, adjoining the district examined during the previous season, were explored as carefully as time and circumstances would permit. These areas include the country on both sides of Miramichi Bay as far east as Shippegan and Miscou islands on the north, and Point Escuminac and Point Sapin on the south; also the chief part of the district drained by the North-West Miramichi River and its affluents, and by the Nepisiguit River. A large portion of this region is still forest-clad however, and consequently the present description, so far as it relates to topography and surface geology in the interior, is only of a general character. The chief points elucidated by the season's investigations are of much interest, both as regards the glaciation and the distribution of the surface deposits, and the results are confirmatory of previous observations made in this and contiguous areas, as will be shown in the sequel. Reference will here be made to the main facts noted:—Chief among these is the existence of pre-glacial or pre-quaternary rock debris, or gravels and sands, occupying considerable tracts, especially upon the Pre-Cambrian and Middle Carboniferous areas. The distribution of this débris and gravel is very difficult to trace, as they are usually masked by later deposits; but they appear, so far as they have been observed, to be thickest in the coastal districts and thin out irregularly towards the limits of the Carboniferous rocks to the west, re-appearing however, in the unglaciated areas of the interior, upon the Cambro-Silurian and Pre-Cambrian belts. The relations of these materials to the rocks underneath, as well as to the overlying surface deposits, have been carefully

Summary of main facts noted.

noted wherever exposures occurred, and a description of them will be given further on. Another subject of consideration was the enormous quantities of boulders strewn over all parts of the area under discussion, apparently derived from the more crystalline portions of the Cambro-Silurian and Pre-Cambrian rocks referred to. The absence of marine terraces in all places higher than the 150 to 175 feet contour line above sea level, indicating that the early Post-Tertiary subsidence did not exceed that limit, also afforded a question for study. Not less important perhaps, was the investigation with reference to the extensive peat bogs and sand dunes occurring here. The great development of the former near the coast, especially on Miscou and Shippegan islands, at the mouth of Tabusintac River, and at Point Cheval and Point Escuminac was noted ; and the extensive accumulations of blown sand skirting the shores, forming beaches, islands, etc., also came under review. These peat bogs and dunes are still in process of formation. The intervals and terraces along rivers, which on the North-West Miramichi and its tributaries have a considerable breadth, were likewise examined and their peculiar features investigated. Aneroid measurements of the heights were made at all accessible points, and surface contours, generally, carefully observed. The limits of the forest-covered tracts and of those portions overrun by fires, especially the great Miramichi fire of 1825, were traced ont approximately and mapped. The old Indian camping grounds at Tabusintac and Derby were also visited and a few relics found. Special attention was given to the character of the soil and its relation to the underlying rock formations. Details regarding each of the above topics will be found in the following pages.

TOPOGRAPHIC FEATURES.

Chief topographic features.

The chief topographic features of the region under examination were given in report G G (Annual Report, 1885), and are comparatively simple when viewed in their general aspect. They consist of a highland region in the west, underlaid by the Pre-Cambrian and Cambro-Silurian rocks, and a level, or gently sloping plain in the east occupied by Carboniferous sediments. Minor irregularities diversify the surface of the central and eastern portions of the district however, many of which, as for example, that part of the low valley of the main South-West Miramichi River included in the map, the valley of the North-West Miramichi from Red bank to Portage River, and that of the North-West Millstream, etc., extend transversely to the main slope. The larger river valleys are all of pre-glacial origin. Where they pass through Carboniferous rocks these valleys are comparatively shallow, having been largely filled with fluviatile and marine deposits. During

Evidence regarding elevation of region in later Tertiary period.

General elevation and description of Pre-Cambrian area.

Non-glaciated character.

the later Tertiary period, the region stood at a higher level than at present; for there is evidence that at the confluence of the North-West and South-West Miramichi rivers they flowed along channel bottoms then which are upwards of 100 feet below the existing sea level now, (see p. 14 GG Annual Report, 1885). The upper portion of the main North-West Miramichi and of its chief affluents, and also the Nepisiguit have all cut deep trenches into the older rocks, and produced some remarkable topographic features in the area drained by them. The tract of country occupied by the Pre-Cambrian here is high and rugged, the general level above the sea being not less than 1200 to 1400 feet. Mountains loom up on every hand, 1500 to 2000 feet high,* with valleys between them extending in all directions. In these lie numerous small lakes. Viewing the country from some crowning peak, it has an extremely mammillated appearance, and may be said to resemble a sea of hills. Much of it having been denuded of its forest-covering by fires, and presenting only bare, boulder-strewn acclivities and peaks, its sterile features are thus brought prominently into relief. So varied and irregular, indeed, are these that no adequate description of their countless diversities of form can be given. The original table land, if such it ever was, has been intersected in every direction by valleys of erosion. No traces of glaciation were observed, apparently all the excavating and sculpturing which fashioned these ancient hills having been effected by subærial disintegration. In the valleys and on some of the slopes of this Pre-Cambrian area, especially along the Nepisignit, the original forest still remains, but fires and the lumberman's axe are every year making further encroachments on it.

Description and height of Cambro-Silurian belts.

The areas occupied by Cambro-Silurian rocks are of somewhat less elevation than the Pre-Cambrian, and have by no means as rugged a surface, being rolling and the hills having long sweeping outlines. In the vicinity of the Nepisiguit, and, indeed, in the whole region between that river and the Little South-West Miramichi the general elevation of the Cambro-Silurian, especially of that portion lying between the two Pre-Cambrian belts, is 900 to 1000 feet, with occasional summits rising to 1500 feet. The south-western band of these rocks bordering the Carbonifirous area is, however, much lower and less rugged, and contains many tracts of good land. (For a graphic description of this interior region, see Dr. Ells' report (Report of Progress 1879-80).

General features and elevation of Carboniferous area.

In the Carboniferous area the surface does not anywhere rise higher than 500 or 600 feet above the sea, and the larger portion included in the maps only from 150 to 200 feet (see 200 feet contour line). This tract has likewise been subjected to prolonged denudation. Wide, low, east-and-west valleys are characteristic features, especially in the area between the Baie des Chaleurs and Miramichi, and undoubtedly owe their origin to subaerial and glacial erosion. Most of these are traversed and drained by the rivers and streams of the district. In the areas between river valleys and also about the heads of the small streams, where the drainage is insufficient, shallow peat bogs are of common occurrence.

---

* The elevations are all above sea-level, unless otherwise stated.

Rivers and Lakes.

Character and age of principal rivers.

The two principal rivers of the district, viz., the Nepisiguit and North-West Miramichi exhibit somewhat different features. The latter has numerous branches ramifying to the west and north, and drains, in proportion to its size, a much larger area than the Nepisiguit. Its wide, drift-filled valley in the lower part, and its silted up estuary (see Annual Report, 1885, p. 14 G G) afford evidence of its being the older of the two. It is probably of pre-Carboniferous date. The Little South-West, its chief affluent, and the swiftest river in northern New Brunswick, appears, from the large quantities of drift material occupying its valley, to have been at one time a larger river than the main North-West. A noticeable feature of the North-West Miramichi, probably due to peculiarities in the mode of drainage, is its wide shallow channel, especially in that part of its course traversing the eastern belt of the Cambro-Silurian and the Carboniferous rocks. The region around the head-waters of this river being mountainous, and largely denuded of forest, the snow every spring is more rapidly melted there than farther down where it passes through a forest-clad tract. Hence floods from the upper part of the river are precipitated into the lower reaches, widening the channel, and often overflowing the flats bordering it. Summer and autumn floods act similarly when they occur, as they occasionally do, the rainfall of the region about the head waters of the river being then likewise more rapidly drained off. Hence large quantities of detritus from above are deposited along the lower part of the river's course, where the country is comparatively low and flat, partially filling its channel, and causing the waters to spread and erode the banks and intervales bordering it.

Singular features of N. W. Miramichi.

These peculiarities in the North-West Miramichi seem to be the result of the disappearance of the forest in the region about its head waters. During the melting of each winter's snow, or during other floods, it thus rises above the normal height and soon runs out, so to speak, very little of the precipitation being held in the lakes and tributaries there as a reserve supply. The summer level of this river is consequently very low, considerably lower I am informed now than previous to the devastation of the forests.

Nepisiguit probably of Post-Tertiary age in lower part.

In reference to the Nepisiguit, the observations of the past season pear to confirm the conclusions arrived at in report G G (Annual eport, 1885), viz., that in the lower part of its course, *i.e.*, from the arrows downwards, its present channel is of modern date, regarded om a geological point of view, and may have been formed chiefly in e Post-Tertiary period.

The other rivers of the district exhibit no features requiring special ention, except, perhaps, Napan and Black rivers, which have val-ys widely and deeply filled with marine deposits capped with allu-ums. During the emergence of the land from the early Post-Tertiary bsidence, the waters of the main South-West Miramichi must have rtly flowed out in this direction carrying sediment and probably ulders thither, as much of the material constituting the surface de-sits here seems to have been derived from the region drained by at river. The finer material has, however, been partially remodelled nce by the sea.

CLASSIFICATION OF THE SURFACE DEPOSITS.

Classification of deposits.

The following deposits were met with in the district included in the arter-sheets 2 N E, and 6 S W. the series being in descending order:

M 3

Alluviums, or Recent Deposits.

Fresh-water.

(*a*)

1 Decayed vegetable matter, or vegetable mould,
2 Peat bogs,
3 Lacustrine and fluviatile marshes,
4 River flats (intervales)

Marine.

(*b*)

1 Estuarine flats,
2 Salt marshes,
3 Sand dunes,

M 2

Stratified Sands, Gravels and Clays.

(*a*)

1 River terraces and kames of river valleys.
2 Stratified inland gravel, sand and clay.

(*b*)

1 Saxicava sand and Leda clay

M 1

Glacial Deposits.

1 Boulder-clay or till, boulders and erratic blocks.

Pre-glacial.

1 Rock-debris *in situ* (gravel, sand, etc.)

PRE-GLACIAL ROCK DEBRIS, GRAVELS, ETC.

Pre-glacial rock debris, &c., character and mode of occurrence of.

Among the more remarkable phenomena characterizing the surfa deposits of the district are beds of rotted rock *in situ*, chiefly in t form of gravel and sand. These are most abundant in the trac bordering the Gulf shores, but are found also on the higher groun of the interior. The materials consist of gravel, containing pebbl and boulders wholly of local rock, and occasionally beds of sand, a are unstratified except where they have not been sufficiently deco posed to obliterate the stratification of the original rock. They r upon the surface of the unabraded rock beneath, which is genera uneven and covered with fragments of the underlying strata in proc of decay. Usually these gravels do not exceed a foot or two in thic ness, often less; but sometimes they are five feet or more. They a however, for the most part overlain by stratified deposits of subær or aqueous origin. The included pebbles and angular debris a largest and most numerous in the bottom and become smaller and m intermixed with gravel and sand towards the surface, *i.e.*, ha apparently undergone greater decomposition, the further they are fr the solid rock beneath. In some of the sections examined n the coast the rock surface had a sort of mammillated appearan showing that the corroding action had penetrated more deeply in so spots than in others. No foreign boulders exist among this deb or gravel, those which occur being angular and lying longitudina parallel to the rock strata beneath, even when embedded in lo material, thus showing that they are really portions of the origi rock *in situ* not yet decomposed. Indeed, in every instance they w found to belong to the underlying rocks. The following sectic will illustrate the actual position of these gravels in the series and th relation to the other deposits, especially on the coastal area.*

1. On the main post road between Chatham and Richibucto, ab two miles south of Black River bridge, a section of the surface beds exposed in a gravel pit. The series is as follows in descending order:

Sections showing relations to other dedosits.

1. Loamy material, partly composed of decayed vegetable matter with lenticular seams of whitish or greyish sands in the bottom.................................. 3 to 6 inches

---

* Sir J. W. Dawson recognized thick beds of decayed rock at Les Eboulements (Notes on Post-Pliocene Geology of Canada, *Can. Naturalist*, 1872). Dr. G. M. Dawson has observed bed quartzite shingle in the Bow and Belly River country which appear to be pre-glacial (Repor Progress, 1882-83-84). R. G. M'Connell also describes deposits under the name of the " So Saskatchewan gravels," which are probably of similar origin (Annual Report, 1885). Pumpe Hunt, Whitney, Winchell and others have directed attention to similar beds in different part the United States, and Darwin, Selwyn and Hartt have referred to them as occurring in Brazil. Europe like phenomena have been observed; and in Australia Dr. Selwyn recognized the subae decay of the rocks there, and noted the absence of lakes in non-glaciated regions.

2. Gravel and sand, unstratified, containing flat, angular pieces of rock embedded therein, apparently *in situ.*	1 ft. 6 inches
3. Rotted rock, with loose pieces of the underlying sandstone in their natural situation, but with a little gravel and sand in the interstices.................	4 to 5 feet
4. Grey sandstone showing still less decomposition and apparently passing into the usual stratified or bedded Middle Carboniferous rocks beneath.......	1 to 2 "

The height of these beds above sea level is about 80 feet.

2. Behind the village of Nelson, on the road leading to the back ttlements, the following series appears in a cutting :—

1. Stratified sand and gravel..	12 to 15 inches
2. Boulder-clay, chiefly gravel, but with sufficient clay to cause it to bake hard on exposure................	6 to 12 "
3. Decomposed or rotted rock, chiefly gravel, unstratified, the fragments of rock 1 to 3 inches long and mostly *in situ*	12 to 18 "
4. Grey sandstone (Middle Carboniferous), crumbling and decaying, *in situ.*	

Height of these beds about 100 feet above the sea.

3. At Nepisiguit bridge, near the town of Bathurst, another section these deposits exhibits the following series (descending) :—

1. Sandy or gravelly soil, loamy in places, containing pebbles of foreign as well as of local rocks.........	3 to 6 inches
2. Stratified gravel, including pebbles and boulders. Among these are travelled boulders, 1 to 2 feet in diameter, glaciated. Bulk of material, however, belonging to local rocks	12 to 15 "
3. Till, or debris of local rocks, which appears to have been shifted and acted upon by ice. It contains angular pebbles and boulders apparently transported some distance. Pieces of the Lower Carboniferous (underlying) rock, 3 to 9 inches in length, lie under and also enclosed in the lower part of the till with more or less gravel and clay in the interstices..........	2 to 3 feet
4. Decomposing Lower Carboniferous rocks *in situ.*	

Evidently the ice of the glacial period, in its eastward passage over e surface of the Middle Carboniferous area here, thinned out and was t of sufficient thickness or weight to displace or remove the whole of e pre-existing decayed rock material. The loose shales or pieces of tted rock underneath what appears to be boulder-clay are one to two et deep in places, below which they become more solid, *i.e.*, contain ss gravel and sand in the interstices, until they gradually change into e usual Carboniferous rock of the district.

M I. Glacial Deposits.

Boulder-Clay or Till.

Boulder-clay.

Boulder-clay is abundant in river valleys and on slopes in th
interior of this district, but is seldom met with near the coast. Th
North-West Miramichi valley, from where the Intercolonial Railwa
crosses it, up as far as Portage River and probably further,
lined almost continuously on both sides with till, and it was also see
on the slopes of the minor valleys in numerous localities. Apart fro
its occurrence in these, however, it does not anywhere form an u
broken sheet, usually appearing in lenticular masses. In a number
places it rests upon pre-glacial rock-debris, as shown in the foregoin
sections, and is almost invariably overlain by stratified deposits. It
evident also that till in considerable quantities was thrown into th
river valleys and depressions during or at the close of the ice ag
partly filling them and producing changes in the drainage. This pa
tial blocking up of the water courses held up the waters of even th
larger rivers in many places, especially those of the North-West Mir
michi and its affluents, to a height of 80 to 100 feet above their prese
level. In the vicinity of Redbank a drift-dam of this kind existe
in the Post-Tertiary period, causing the formation of terraces whic
will be described on a following page.

Whence derived.

In all cases, the till, wherever observed, seems to be largely derive
from pre-existing rotted rock belonging chiefly to the underlying form
tions in each particular locality, but somewhat changed in mechanic
consistency and appearance by glacial action. In certain places upo
the Carboniferons area this change was seen to be only partiall
effected, and the flat pebbles and pieces of sandstone or slabs wer
sometimes only partly turned over or disturbed, while the intermixe
clay had, in its bluish-grey, unoxidized aspect, every resemblance t
boulder-clay.

Localities where observed

A few of the more noteworthy localities where till was observed ma
here be specified.

On Miscou Island, on the north-east side of Miscou harbour, and o
the east side of Shippegan Island till occurs. It is overlain in bot
places by Leda clay and Saxicava sand. If the till here is dueto lan
ice, the land has probably been as high, if not higher, than at prese
when it was laid down. A slight subsidence would submerge the
islands, scarcely any part of them at present rising more than 25 to 3
feet above sea level. This till is constituted chiefly of boulders an
debris of local rocks.

Hospital and Sheldrake islands, in Miramichi estuary, are largel
covered with till.

A bed of till occurs at the mouth of Black River, also another on t west side of the mouth of Bay du Vin River. These contain glaciated boulders.

Boulders striated while held in upper portion of till.

On the road leading from Upper Chatham to Napan River, and on t main Chatham and Richibucto road just south of Black River idge, also on the road going through the back settlements from lson to Barnaby River station, till was seen in several places with aciated boulders embedded in its upper part. Some of these boulders em to have been striated while in their present position by ice which oved over them from west to east. They lie longitudinally in this rection with the upper glaciated side sloping gently to the west as i Fig. 1. Pre-glacial debris was observed to underlie them in two these places.*

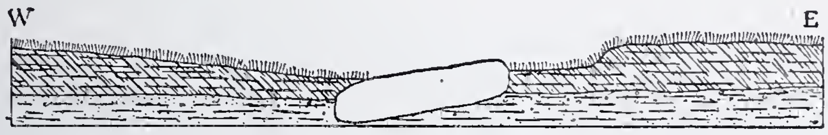


FIG. 1. SECTION SHOWING POSITION OF STRIATED BOULDERS IN DRIFT.

Till is found in the South-West Miramichi valley in numerous places thin the limits of the map. Heavy banks, chiefly of till, occur near rby Junction and at the confluence of the South-West and North-West rivers, rising above the general level of the valley, (referred to page 28 G G, Annual Report, 1885).

At the mouth of North-West Millstream, till, partly filling the valley that tributary, was seen resting on glaciated rock surfaces (see List Striæ No. 7).

Till was observed in several places along the road leading up the ıth side of the Little South-West Miramichi; and just above Red-nk to the east of the main North-West a bed of till, abundantly ermixed with boulders, was seen.

Remarks on striated boulders.

In reference to the glaciated boulders embedded in the upper part of till or pre-existing rock debris, referred to above, the question arises re their upper surfaces really striated while they were held in their esent position by the enveloping material (boulder-clay, gravel, etc.) the ice passed over the district. The parallelism of the striæ upon em with those on the rock surface of the district in which they occur, as o the attitude of the boulders themselves with respect to the abrad-g agent, tends to support this view, rendering it probable that the enomena are similar to those described by Mr. Hugh Miller as ob-rved in Scotland. There is abundant evidence in the presence of

---

Phenomena of this kind were first observed in Canada by Sir J. W. Dawson, see The Post-ocene Geology of Canada, *Canadian Naturalist*, 1872.

striæ on rocks *in situ* and till and other transported boulders from t interior that ice passed over the country here from west to east; b it would seem that even when the glaciers had attained their maximu thickness they must have thinned out on the particular district whe these boulders were thus left, and perhaps disappeared altogether befo reaching the present coast line, except in the valleys. Pre-glaci debris of subaerial origin occurs in sheets under them in mo places where sections are exposed, affording proof that the ice cann have been thick or of great weight. It seems reasonable to inf therefore, that the ice moved over the surface of the decayed ro material, eroding and displacing only its upper part, striating the roc where they were nearest the surface or most exposed, and also t upper surface of these boulders at the same time.

Boulders and Erratic Blocks.

Boulders and erratics whence derived.

Boulders, derived from the Cambro-Silurian and Pre-Cambrian roc of the interior, consisting chiefly of granite, gneiss, felsite, trap, et from five feet in diameter downwards, are found profusely scattered ov the surface of the whole Middle Carboniferous area and also embedd in the deposits. Associated therewith, and in certain places largely p dominating in numbers, occur others derived from the underlying rock Upon the surface of the Pre-Carboniferous rocks of the interior, bou ders are likewise strewn in immense profusion, and bear evidence, so f as observations have extended, of having, in some places, been tran ported limited distances from the parent rocks to the west.

How transported.

Near the coast, especially below the 200 feet contour line, the p sent distribution of boulders seems to have been effected by floati and shore ice, etc., as well as by glaciers. A greater number of tho properly called erratics are seen upon the surface here, and apparent they have been subjected to greater wear, being, as a rule, mo rounded and with the striæ in most instances defaced. Planed sid are still however, characteristic features of these. Sparingly int spersed among them are a few which seem not to belong to this d trict, and the parent rock of which is unknown. These are alwa found on or near the present shores.

Greater abundance on north side of Miramichi estuary.

Boulders of crystalline rocks seem to be more abundant on t southern than on the northern side of the Miramichi estuary. T cause of this is difficult to explain, but it is probably due, in part least, to the fact that during the Post-Tertiary submergence, river a coast ice carrying boulders would be more likely to be driven again the shores of the southern side of Miramichi Bay by the prevaili north-east and north-west winds than in any other direction, and th deposit them.

Along the shore to the east of Escuminac Point, granite boulders ree to five feet in diameter were seen on the top of the peat bog and d beaches there. They appear to have been recently pushed up by e impact of coast ice, or, perhaps, thrown up by the waves during avy storms.

Boulders on top of peat.

Glacial Striæ.

The following striæ were observed during the past summer in the eas mapped. The courses are referred to the true meridian and the vations to sea level.

List of striæ.

	LOCALITIES.	COURSES.	GENERAL SLOPE OF SURFACE.	APPROXIMATE HEIGHT.
	GASPE PENINSULA, QUE.			
	On a ridge at Newport, half a mile from the shore, occur glaciated rocks, but no distinct striæ. Stoss-side to the N.W.	S.E.	S.E.	165
	Along main road east of bye-road leading to Point Maquereau Light House. Striæ .... (These are on the eastern slope of a ridge running out to form Point Maquereau).	S. 85° E.	S.E.	250
	GLOUCESTER COUNTY, N.B.			
	At E. Smith's, Middle River settlement. Striæ	N. 46° E.	E.	250
	NORTHUMBERLAND COUNTY, N.B.			
	Behind Nelson village, on second concession lots. Striæ....................	S. 83° E.	E.	150
	Behind Upper Chatham, about half way between the Miramichi and Napan rivers. Striæ...................... (These correspond with the striæ noted at Beaver Brook station, Intercolonial Railway, and at Rogersville station; also with those seen in the valley of the South-West Miramichi at Indiantown (see report G G, p. 22, Annual Report, 1885, Striæ Nos. 64 and 66).	S. 83° E.	E.	125
	At North-West Millstream, near bridge on road along main river. Striæ, covered with a thick bed of till..... (These striæ agree in direction with others at the head of this stream, (Nos. 60 and 61, report G G just cited,) and show that a small local glacier moved down the North-West Millstream valley, debouching into the estuary of the main North-West).	S. 22° W.	S.	25

General Conclusions respecting Glaciation, Boulder Distribution, Etc

The conclusions deducible from the foregoing facts may be brief stated as follows :—

General glaciation of district.

1. The ice of the glacial period moved from the west down the ma slope of the district towards the Gulf of St. Lawrence, carrying lar quantities of debris from the Cambro-Silurian and Pre-Cambrian rocl of the interior and strewing it over the whole surface, as pointed o in report GG (Annual Report, 1885). The glacier or glaciers we guided in their movements by the more prominent topographical fe tures and especially by the river valleys, but thinned out or final disappeared before reaching the present coast line, no evidence bei afforded that they debouched into the sea anywhere, except, perha in estuaries. And the undisturbed pre-glacial debris met with the low coastal tracts shows either that the ice did not rea these, except in a very thin sheet passing very lightly over the or that these tracts were submerged during the greatest extension the ice. The boulder-clay overlying the pre-glacial debris and t striated boulders over which the ice has apparently moved, may also cited as proofs of its diminished power and weight when moving ov this particular district.

Secondary systems of glaciers.

2. A minor or secondary system of local glaciers followed the small valleys at a later stage, as indicated by the striæ and till found alo the North-West Millstream (see List of Striæ, No. 6). The glaci producing these seems to have flowed into the open estuary of t North-West Miramichi. To render this possible it is evident that t land must have then stood at a somewhat lower level than at prese and the estuary referred to would consequently be wider. Glaciers this kind probably belonged to the close of the glacial period and m have been contemporaneous with the deposition of the Leda clay.

Boulder distribution.

3. The distribution of boulders near the coast, especially belo the 175 feet contour line, is the result of two causes which m thus be stated:—First, these boulders, or the majority of them, we carried down to the coastal area, more especially along the valleys, glaciers and river ice during or at the close of the ice age. On t submergence of this coastal tract, coast and floating ice acted up these and the till, the sea washing away more or less of the fin and lighter materials, leaving the boulders exposed. These we then rolled about or carried hither and thither by pan or sho ice. Erratics from foreign parts may occasionally have been land on these shores by the same agencies. Other causes no doubt supe vened, but these will serve to explain the occurrence and anomalo distribution of so many boulders from the interior on the surface ne the coast.

M 2. STRATIFIED SANDS, GRAVELS AND CLAYS.

Stratified Inland Gravel, Sand and Clay (fresh-water).

General description of inland stratified deposits.

Deposits of this kind are of considerable thickness above the 200 feet ntour line, more especially upon the Lower and Middle Carboniferous l Cambro-Silurian rocks. Those overlying the former constitute an nost unbroken sheet, the general characteristics and composition of ich have been given in previous reports. The whole series covering surface in the district is, in descending order, essentially as follows :

1. A thin, somewhat irregular layer of loam, or more generally de- ed vegetable matter, together with more or less material formed m subaerial erosion. Underneath this, or constituting a portion of same stratum, especially upon the surface of the Middle Carboni- ous area, occur lenticular seams of fine-grained grey or white sands. e peculiar character and colour of these sands are probably due to deoxidation of the iron in them through the chemical action of the n-water and the decayed vegetable matter overlying them.* Cultition, by mixing these sands with the soil or subsoil, causes them to appear. Land shells are sometimes found in the layer of vegetable tter. A fuller description of this deposit will be given in the sequel, der the head of *Vegetable Mould.*

2. Stratified sand, gravel and clay of varied thickness, the clay ually forming the lowest member and often in lenticular sheets. The bbles in the gravel are almost always of local rock, although along er valleys they have been transported considerable distances. The our of these sands and gravels, and of the upper portion of the y also, is generally of a brownish or yellowish tint, due to the oxi- ion and hydration of the original materials. The lower limit of the athered zone is often sharply defined in the clay beds.

3. Boulder-clay or till in patches on hillsides and in valleys, the dis- bution being irregular and the thickness variable. It includes tra- led boulders from the west and south-west.

4. Pre-glacial debris, or gravels and sands. These occur irregularly on the higher grounds of the interior, thinning out to mere loose bbly beds, as observed in the tract about the head-waters of the rth-West Miramichi.

---

* "The organic matter carried down by the rain-water reduces the iron salt from a peroxide protoxide, which the free carbonic acid present converts into a carbonate : and this salt g soluble is removed by the same surface waters, leaving the upper part of the sand or el colourless or often white. Or, it may sometimes be that the humic acid in the soil re- es the iron as a soluble humate." "When the humous acids can freely attack the hydrated xide of iron they remove it in solution and the decomposed rock or soil is thereby bleached. is common where pine trees grow on ferruginous sand."—(Prestwich's Geology, Vol. 1, p. (Geikie's Text-book of Geology, p. 438.) (For further information on the geological action he humus acids upon sands, gravels, etc., see paper by A. A. Julien, Proc. Am. Association he Advancement of Science, 1879, pp. 339-350.)

How derived.

The origin of these inland fresh-water deposits was briefly cussed in preceding reports. They appear to be derived in the fi place from the decomposed materials of the underlying or subjac rocks. Afterwards, glacial erosion, river and atmospheric acti combined with that of an organic nature, have produced such chan in them, more especially in the uppermost portion, as to partia stratify them, and give them their present character and compositi

River Terraces and Kames of River Valleys.

River terraces.

River terraces of varied width are developed along the North-W Miramichi and Nepisiguit rivers, and, indeed, skirt all the streams any size in the district. Their general features and relation to rivers which they accompany have been discussed in former repo Along the streams traversing the low flat Carboniferous area, n worthy of note were observed; but as we pass up the river vall into the older series of rocks they become more noticeable. The loc ties and elevations of a few of the principal ones met with along North-West Miramichi and Nepisiguit rivers may here be mention The heights given have reference to the rivers at the nearest point.

Commencing with the Nepisiguit we find:—

Heights and localities where they occur.

1. At Middle Landing Narrows a terrace on the north bank 45 to feet high, or 95 feet above sea level.

2. At Grand Falls a wide one occurs also on the north side 60 to feet higher than the river above the falls, or about 315 feet above sea. It is composed of water-worn gravel and sand with a covering loam.

3. Just above the mouth of Nine Mile Brook a terrace lies on north bank 50 to 65 feet high. It has probably been formed by damming of the river at the Narrows five miles below, the interveni valley having then been a post-glacial lake into which the grav etc., composing the terrace were thrown.

4. Near Taylor's Brook there is a long terrace, or high narrow int vale on the north side of the river 6 to 10 feet above it.

Other terraces occur at numerous places, especially wherever banks jut out opposite re-entrant angles or bends of the river, but m of them are narrow and irregular. Viewing them correlatively, ho ever, they indicate that the Nepisiguit flowed 50 to 75 feet above present bed in early post-glacial times.

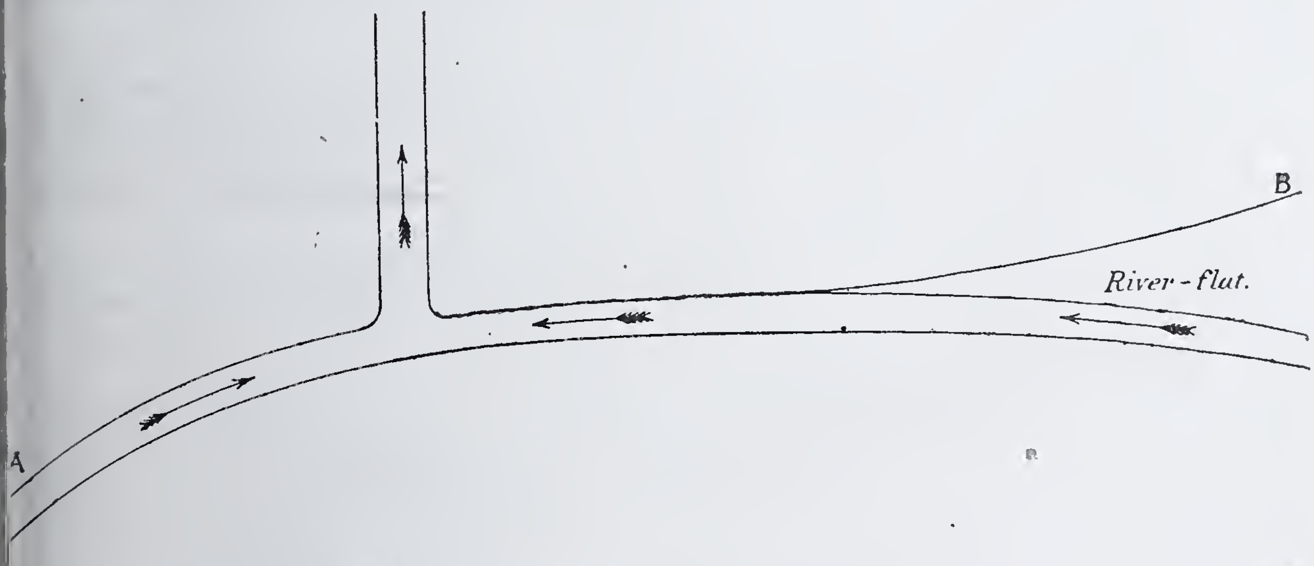
The North-West Miramichi, and more especially its tributary Little South-West, exhibits a number of beautiful terraces, some which may here be briefly described.

5. On the south side of the main North-West, in the triangular tract posite the mouths of Portage and Tomogonops rivers, wide ter- es border the valley above the 200 feet contour line. Their height ove the river is 50 feet and upwards. The materials are, however, detrital. A capping of loam upon them forms good soil.

6. High terraces, probably of marine or estuarine formation, skirt e Little South-West as far up as the head of the settlement, 12 miles m its mouth. At the latter point the river bed is 150 to 175 feet ove sea level, and many of the terraces are 50 to 75 feet higher. rther up they become less conspicuous, but are, nevertheless, above e usual height of the terraces found along other rivers in northern w Brunswick. They are all composed of very coarse, well-worn terial, the result, no doubt, of erosion from the rapid flow of this er, the descent in the lower part of its course alone being not less than feet per mile, further up being much greater.

Remarkable erosion and terraces at Square Forks.

A remarkable illustration of the post-glacial erosion effected by vers and accompanied by the formation of terraces may be seen at the uare Forks of the Big Sevogle. The two main branches of this river re unite in a rocky gorge about 30 feet deep, which is almost in a raight line. At right angles to this the river runs off below through other rocky gorge somewhat as shown in the diagram (Fig. 2.)



IG. 2. Plan showing Portions of Rock Gorges at confluence of the two Branches of Big Sevogle River.

The two branches of the Sevogle have either met at a different point nd had a different pre-glacial channel from their confluence down- ard, or existed as separate streams. From the point B in Fig. 2 down the present confluence of the river with the North-West there is wide, terraced valley (see map) strewn with water-worn gravel, hich may have been its former course. A damming of this pre-glacial alley at B by drift during the ice age would probably cause the xcavation of the gorge below the Forks.

Kames.

River-valley kames are but poorly developed in this region. Sma ones were noted in several places however, and a marked one at tl confluence of the Little South-West and main river. It appears to l the residual portion of a terrace eroded on both sides by these tw rivers.

Leda Clay and Saxicava Sand (marine).

Leda clay and Saxicava sand, mode of occurrence of.

The Leda clay is rather poorly represented in the district under co sideration, the detrital material resulting from the erosion of the Ca boniferous sandstones being chiefly in the form of sand and grave In consequence of this, marine fossils are rarely found in the surfa deposits here. The Saxicava sand is very widely distributed an of considerable thickness in the areas skirting the coasts and riv estuaries. From the elevation of the terraces composed of it (mari terraces) in the Miramichi valley the extent of the earliest Post-Te tiary subsidence can be approximately estimated. A few of the mo noteworthy of these may be described. The elevations are in all case above sea-level :—

Terraces occur on both sides of the mouth of Little South-Wes Miramichi River at a height of 85 feet above sea level. They cove an area of several square miles, and are composed chiefly of Saxicav sand. No fossils.

At the confluence of the Big Sevogle and main North-West River terrace 118 feet high was observed. It appears to be entirely forme of sand and gravel.

One to two miles up Big Sevogle River another was seen on th south side, 160 to 170 feet high, which is also composed of sand an gravel and without fossils.

Opposite the mouth of Portage River a terrace skirts the mai North-West on the south side; height 150 feet.

On the road leading from Chatham to Richibucto, near upper Bay d Vin P O., terraces appear at heights of 120 and 140 feet.

A number of others were noted which it seems unnecessary here t enumerate. Co-ordinating all the facts relating to the marine ter races they show a Post-Tertiary subsidence of 165 to 175 feet in thi district.

Sections showing character of materials.

To illustrate still further the composition of the terraces about th mouths of rivers, and in estuaries, as well as the general character o the deposits below the 175 to 200 feet contour line, the following sec tions will here be given. One examined behind Nelson village is des cribed under the head of Pre-glacial Gravels, etc. Another expose at Tracadie River is as follows, in descending order :—

1. Gravel and sand, with a few pebbles of local rocks. When these are flat and uniform they lie with their longest axes in a horizontal position Thickness....	15 to 18 inches.
2. Grey sandy clay....................................	1 to 3 "
3. Sand and clay in irregular, alternating bands: clay seams 1 to 6 inches thick. Whole thickness........	1 to 2 feet.
4. Clay and sand, clay predominating; seams regular...	2 to 3 "
5. Sandy band, with a few thin strata of clay. Total thickness not known. Exposed in bottom of pit.........	3 "

The clay in this section is of a reddish-grey colour, and in all cases ndy, *i.e.*, nearly a loam. Both sand and clay are invariably free from bbles. From their situation with respect to the Tracadie River these posits are undoubtedly estuarine, although deriving the materials rgely from the river. No fossils were found in them.

Near Caraquette the succession was also found to be as follows in scending order:—

1. Gravel, coarse and angular, and packed with sandstone pebbles and small boulders, also mostly angular, and lying with their longest axes in a horizontal position, the whole irregularly stratified and resembling rotted rock *in situ*. Thickness variable....................	1 to 3 or 4 feet.
2. Sand, fine and without pebbles or gravel and comparatively loose. Thickness likewise variable	1 to 3 "
3. Clay, sand and gravel, forming a hard-pan, containing fragments of the underlying rock but little removed from their original position. Thickness variable.	
4. Rubbly, broken up, decomposing rock.	

General succession of marine deposits.

The succession of these deposits as observed in a great number of ctions below the 200 feet contour line is closely similar to the above, id may be generally stated as follows, in descending order: (1) Gravel ixed with sand, overlain in uncleared and uncultivated ground by egetable mould; (2) sand of varied consistency with clayey, or mixed ndy and clayey strata; (3) clay, with sandy seams, and (4) rotted ock *in situ*, or boulder-clay. On the slopes near the coast between the ouths of rivers, where little or no detrital material from these was eposited, the series consists of (1) loam, or decayed vegetable matter, nder which are sand, gravel and occasionally clay; (2) boulder clay, ut this member usually absent, and (3) pre-glacial debris; or gravel esting on decomposing Middle Carboniferous sandstones. As already ated, very little pure clay occurs in the stratified portion of these eds, owing no doubt to the arenaceous character of the rocks from hich they are derived.

As a rule the thickness of these deposits does not exceed five to ten eet, often less, and the surface is always even. The stratified sands, ravels and clay have been pretty fully described in preceding reports.

M 3. FRESH-WATER ALLUVIUMS.

River-flats, or Intervales.

Intervales.

Along the main North-West Miramichi River and its affluent th Little South-West flats of considerable extent occur and form fine trac of farming land. Between Redbank and Portage River large portio of these are cleared and cultivated, yielding hay in abundance. Nearl all the adjacent terraces are, however, still forest-clad.

The intervales along the Nepisiguit and other rivers of the distric are narrow and of little value in an agricultural point of view. N clearings of any consequence have been made upon them.

In regard to the mode of origin and character of these intervales i may be remarked that the detailed descriptions of similar deposit given in preceding reports apply equally well to those observed in thi district, and, therefore, it is unnecessary to dwell further on them.

Lacustrine and Fluviatile Marshes.

Fresh-water marshes.

Many of the small lakes of the interior are bordered by marsh tracts consisting of boggy or peaty matter, but of such limited widt that they cannot be shown on the maps. Similar marshy selvage skirt the rivers in places where the flow is sluggish and permits th deposition of the finer particles of matter held in suspension by th waters. These marshes are usually covered with a dense growth o ericaceous plants, rushes, carices, marsh grasses, etc., and form retreat for the aquatic fur-bearing animals.

Peat Bogs.

Peat bogs. where formed.

Favorable conditions for their growth.

Formations of this kind are extensively developed near the coast o the Gulf of St. Lawrence, especially on Miscou and Shippegan island and near the mouth of Tabusintac River; also at Point Cheval an Point Escuminac. In these localities they seem to owe their growt to the peculiar climatic conditions of the region bordering the Gul The proximity of the ocean modifies the extreme summer hea prevailing inland, rendering the air moister and more favourable t the continued existence of mosses and other plants peculiar to thes deposits. In the interior there are also numerous peat bogs upon th Lower and Middle Carboniferous areas, but they are generally thin an of smaller extent. Usually the latter are fonnd to occupy shallow lak basins which are bordered, and occasionally wholly covered, with scrubby growth of hacmatac and black spruce. A remarkable featur of the bogs near the coast is the great number of small ponds dottin their surfaces. These ponds have perpendicular sides of peat, and var

Ponds in peat bogs, how originating.

size from a few square yards to a quarter of an acre or more. Their
ode of origin is not apparent, but it is probably due to the continuous
owth of mosses, etc., around little pools which occupied a former sur-
ce, the pools preventing the growth of mosses underneath them, while
ound them the height continued to increase year after year. For
e most part these peat bogs are treeless, but are covered with plants
longing chiefly to the following species,—rose-bay, Labrador tea,
o species of vaccinium, the huckle-berry, leather-leaf, andromeda,
d along the shores overhanging the drier banks, the crowberry, etc.
ief descriptions of the largest of these bogs will now be given.

Descriptions and localities.

Miscou bog.

1. The principal peat bog in the district occurs on Miscou Island and
vers fully half of its entire area. It occupies a shallow basin in the
iddle Carboniferous rocks here, portions of the rim of which, as well
of the sand and peat, are being eroded by the sea. The surface of
e bog is 15 to 20 feet above high tide level in the centre, while the
ttom, which is full of the roots of shrubs and small trees *in situ.*,
ems to be below that of the lowest tides and wherever visible appears
rest on gravel and sand. The bog, as already mentioned, is dotted
ll over with ponds, which form favourite resting places for the wild
eese and brant in their passage over the region every spring and fall.
ranberries abound on it.

Shippegan.

2. A peat bog about three miles long and one and a half wide was
een on the eastern side of Shippegan Island, which also rests on a hard-
an of gravel and clay. The surface is 10 to 15 feet above the sea and
s likewise destitute of trees. Numerous ponds were also observed on
t. In the bank the peat is 10 feet thick, the bottom descending below
igh tide level.

St. Simon.

3. The neck of land between St. Simon inlet and Pokemouche har-
our (see map) is formed of peat. Similarly to the two beds just des-
ribed it is considerably higher in the central part than at the margin,
ut nowhere is more than 10 to 15 feet above high tide level. A part
f this bog is on sheet 3 S E. Immense quantities of cranberries
grow upon it.

Tracadie.

4. South of Tracadie River, near Point Barreau, (see map) a peat bog borders a lake, both being surrounded by a tamarac swamp.

Tabusintac.

5. An extensive bog occurs on the west side of Tabusintac River; length about three miles, width two miles. Its general features are the same as those described. It is also a favourite resort for wild geese, brant, etc., every spring and autumn.

Point Cheval.

6. On the east side of Point Cheval a bog was also seen which thins out on the northern margin over an old sand beach. The following section of the beds, in descending series, may be instructive :—

1. Peat, dark brown in colour, containing a few roots of small trees and shrubs and abundant remains of mosses, 5 to 7 feet.
2. Dark, almost black peat, filled with stems, roots and rootlets of small birch, cedar and hacmatac trees, and heath plants. Numerous stumps of trees *in situ* occur in the bottom of the peat, and the roots penetrate, or more generally spread out over, the underlying sand. Some of these stumps are a foot in diameter........... 2 to 3 "
3. Pure, fine-grained sand, rusty and dark in upper part, into which the roots referred to sometimes penetrate a few inches. Apparently continuous with and forming part of present beach, but must be older, as it descends below sea level in places. A sharp line of demarkation between this and last member of the series. Drift-wood and sticks three to six inches in diameter appear to have been strewn over the old beach before it became covered with peat.

The surface of this bog is 10 to 15 feet above high tide level, and th bottom of the central part, so far as could be observed, sinks below the lowest ebb tides.

Point Escuminac.

7. Another large and interesting peat deposit was found at Point Escuminac (see map), referred to in Dr. Ells' report (Report of Progress, 1879-80). It is highest in the middle and likewise dotted over with numerous small ponds. From the examination made around its margin it seems to occupy a basin also, the central part of which is below high tide level. This gives it a thickness of 20 feet or upwards. Mr. Philips, light-house keeper, Point Escuminac, informed me that he found it 24 feet deep in one place. Like those already described it is almost treeless, but covered with heath plants. A section of the peat and underlying beds, taken near the Light-House, is as follows, the series being descending:—

1. Peat .... 7 to 8 feet.
2. Sand, coarse and gravelly, chiefly derived from the underlying gravel, but with more or less beach sand and foreign pebbles ; the whole partially stratified......... 6 to 9 inches.
3. Gravel *in situ*, derived wholly from underlying sandstones or shales. Thickness variable.
4. Grey, Middle Carboniferous sandstones or shales.

Burnt log in peat.

Among the numerous stumps, trunks of trees and sticks in the bottom layers of the peat, or between divisions 1 and 2, a log partially burnt was observed. It is part of the trunk of a spruce tree, and has been split and shattered before it was thrown up here by the sea. About seven feet of it project out of the bottom of the peat. Three spots on one side were charred and hollowed out slightly by fire. The stumps and roots in the peat bottom around it are *in situ*.

his burnt stick is similar to many other shattered ones lying upon existing beaches and seems to have reached its present site before peat began to grow. Its exposure now is caused by the wearing y of the edge of the peat by the sea. Whether it is any proof of occupancy of these shores by human beings before the growth of peat beds, remains to be considered.

Peat beds affording proof of slight subsidence of region since commencement of their growth

study of all the phenomena connected with these peat beds leads ie conclusion that a slight subsidence must have taken place in this ict since the commencement of their growth. The bottom of e deposits seems to be at least 10 to 15 feet below high tide level ome places, and from their proximity to the coast the basins occu- by them, if emptied of peat, would be inundated, were the relative ls of the sea and land the same when the peat began to grow as . Hence this coast area must have been 10 to 15 feet higher, if not e, with respect to the sea then. Moreover, the fact that the bottom hese peat bogs, wherever exposed, is invariably found to contain ips of trees *in situ* of species now growing in swampy tracts near coast, at a height of 10 to 25 feet above sea level, corroborates the e view. On the other hand the sand beaches now covered by peat nd the borders of the basins enclosing it, upon which logs, sticks, ips, etc., have apparently been strewn by the tides before the peat v on them, indicate that the change of level cannot have been h greater than that stated above.*

hese bogs appear to be still increasing in height and breadth. The has, however, broken through the barriers of sand and earth which osed the peat basins originally, exposing their margins in certain es to its erosive action. Elsewhere they are protected by sand ks recently formed. Their economic value will be referred to her on.

Vegetable Mould, or Decayed Vegetable Matter.

Vegetable mould, how formed.

pon the surface of the forest-clad areas and also on newly-cleared s, a layer of material occurs often two inches or more in thickness, isting largely of dead leaves, rotten wood, remains of herbaceous ts, etc., the lower portion of which, at least, is decomposed into ius. This was referred to on a previous page. As the soil undergoes

---

* here are evidences of one upward and two downward movements of the land in northern Brunswick during the Post-Tertiary period. First, a subsidence which apparently com- ed in the glacial period, the maximum of which was reached about its close or soon after . The land then stood about 20) feet below its present level relatively to the sea. The Leda clay appears to have been laid down at this stage. An upward movement followed, g which the upper portion of the Leda clay and the Saxicava sands were deposited, this ment continuing till the land had again risen 10 to 25 feet, or perhaps more, above its ex- level with respect to the sea. The peat and marl beds were then formed, and a second subsidence began which has probably been in progress until recently.

Causing fertility.

cultivation, this matter becomes disseminated through it and disappea to a large extent. The fertility of newly-cleared lands, especially u lands, depends almost wholly on its presence.* These often yield cro for three years in succession without manure of any kind; but undergoing cultivation by the plough they deteriorate and without t application of fertilizers, become, in a short time, comparatively val less. These remarks have reference more particularly to tracts which a underlain by sand and gravel, as wherever clay beds or alluviums occ the original fertility of the soil is much longer retained. This decay vegetable matter seems to be more abundant in the soils of river-fla owing to the quantities carried down by the rivers and deposit thereon from time to time as they were in process of formation. A cordingly these soils contain a considerable proportion of humus. the interior of the district under consideration most of the hills a mountains are devoid of any organic matter in the scanty soil coveri them, and often exhibit only bare rocks or shingly slopes wh support a thin dwarfed growth of trees.

M 3. MARINE ALLUVIUMS.

Sand Dunes.

Sand dunes, why abundant in the district.

Sand dunes are of unusual extent in this district, considering that th are merely marginal deposits. This is no doubt due to the fact that sandstones of the Middle Carboniferous area, along the coast of wh the dunes occur, have, in the process of disintegration, supplied grea quantities of arenaceous material than other rocks. From the imme beds of sand forming islands and beaches, in the Miramichi Bay, it evident the denudation of the estuarine borders and coast has b enormous. The Miramichi River appears to have been the ch instrument in effecting this, but every stream flowing into this par the Gulf of St. Lawrence has, no doubt, carried down greater or l quantities of sandy detritus.

Localities where dunes occur.

The character of these sand dunes was described in preceding ports. It will be sufficient therefore to briefly mention the locali of such as are known to occur in the district.

---

* The existence of this superficial layer has hitherto been overlooked ; but in the study of surface deposits of this district it became evident, from its thickness in many places and it lation to the seams of whitish or greyish sands underneath or associated therewith, th was necessary to recognize it as a member of the series. In the natural forest-clad condition o country it forms an almost universal layer, continuous with the peat beds, which indeed ma considered as a thickening of this vegetable layer in particular localities by the additional gr of mosses, etc. For the present therefore it is classed provisionally with the fresh-water viums.

t the north point of Miscou Island, and extending half its length the north-west side, a wide beach occurs, consisting of ridges allel to the shore line, the surface being five to eight feet above inary high tide level (see map). The inner, or first-formed ridges, now clothed with trees (white spruce, white birch, etc.) Spruces e inches to a foot in diameter and 20 to 30 feet high are common, oming smaller and more scattered towards the more recently med portion of the beach. The ridges are all about the same height, change of level being indicated during their formation. Walrus es occur in the oldest of these, although the living animal is not seen djacent waters now.*

unes skirt the whole eastern coast of Miscou Island, almost closing harbour on that side, and stretching along the north-east part of ppegan Island nearly to Pigeon Hill.

t the entrance to Shippegan harbour (east side) sand dunes extend ng the shore, and thence nearly to Barreau Point (see map), enclos- Pokemouche and Tracadie lagoons.

ll the islands in Miramichi Bay, except Hospital, Sheldrake and are formed of sand. They have each a nucleus of dry gravel or k *in situ* similar to that of the adjacent mainland, however, around ich the sands have collected. Ridges and mounds formed by the ds and waves are characteristic features of these dunes. Their area ms to be increasing, and extensive shoals surround them. Most of se dunes are clothed with a dwarfed growth of trees or shrubbery the central of nucleal part.

Nuclei of gravel or rock in some dunes.

Salt Marshes.

Salt marshes occur in small patches at Tracadie lagoon, also at busintac, Neguac, etc. The only ones large enough to map were en on the western side of Point Cheval and at the mouth of Black ver, also on the inner side of Vin Island (see map). On all these y in considerable quantities is annually cut. At the mouth of ennison's Brook, and inside of Huckleberry lagoon (east side), as ell as in other localities, small marshes were also noted. For previous scriptions of salt marshes see reports of 1885 and 1886.

Salt marshes, where found.

---

* Settlements are said to have been founded here in the 17th century by the French for the rpose of capturing the walrus or sea-cow. Such an exterminating war was waged against this rine animal that it soon became extinct in this part of the Gulf. It is claimed that there may ll be seen the ruins of the post of the Royal Company of Miscou, which was founded in 1635 r the prosecution of walrus fishing etc., and for a time derived a great revenue therefrom. e island takes its name from the mission of St. Charles de Miscou, established here at an early te by the Jesuits. For further information see Perley's Reports on the Fisheries of New runswick and Hind's Preliminary Report on the Geology of New Brunswick, 1865.

Estuarine Flats.

Estuarine flats, great breadth of.

Estuarine flats occupy areas of greater or less breadth in Miscou a Shippegan harbours and in Pokemouche and Tracadie lagoons. In mouths of the several rivers debouching into Miramichi Bay, and a among the islands which occupy it, wide expanses of sand, cal "sandbars", are either laid bare at ebb tides, or covered only wit few inches of water. These usually support a dense growth of mar plants.

The general character of these formations was discussed in previ reports, and it is therefore unnecessary to go into further details garding them.

AGRICULTURAL CHARACTER, SYLVA, ETC.

General agricultural character of the district.

The agricultural character of the district under consideration p sents no new features, except such as have been incidentally mention in previous pages of this report. The soils and subsoils bear, perha a closer relation to the underlying rocks than in the coastal areas the Baie des Chaleurs basin, and are likewise deeper, usually maski the strata completely everywhere, except on the Pre-Cambrian bel Even where the surface is strewn with boulders foreign to the partic lar locality, the great bulk of the deposits belongs to the underlyi rocks. The denudation which the region has undergone has carri away much of the finer material from the higher grounds and slop however, often leaving only a coarse gravelly or shingly soil. In t valleys there is usually a thick deposit of clay, gravel and loam, a wherever the latter is found, the soil is rich and productive.

Soils upon the Middle and Lower Carboniferous Rocks.

Soil of Carboniferous area above 200 feet contour lines.

The general character of these soils as met with in the Baie d Chaleurs district was described in some detail in my last report (A nual Report, 1886), and the remarks therein respecting them, especial as occurring in eastern Gloucester, are also applicable to those of tl district now under discussion. On that part of it above the 200 fe contour line, the soil, more especially on the drier grounds (leaving o of consideration the vegetable layer usually occupying the surface), a dry stony gravel or sand with an admixture of clay in certain local ties. Where the sand and gravel predominate, it is exceedingly poro and light, but where clay prevails it generally has a hardpan unde neath, and, if flat, is often wet and swampy. This hardpan, which almost impervious to water, consists of fine sand and clay, with mor

ss gravel intermixed, and is in some places stratified, in others a
till. It is found in flat districts or in low inland valleys where it
ten covered only by the vegetable layer referred to on a previous
e, which is here thicker than upon the ridges. Where there is
cient slope to afford good drainage, the clay soils are usually fertile,
as they are wanting in organic and calcareous matter they require
uent applications of fertilizing material to render them productive.
low flat or undulating tracts, however, need, besides this, a proper
em of draining. Without it, except in very dry seasons, their
luctiveness is much less than that of the drier grounds.

Soil of Carboniferous area below 200 feet contour line.

elow the 200 feet contour line the soil is, generally speaking, much
rior to that inland. The surface has usually a gentle slope towards
Gulf shores and on this account is better drained, while along
y of the river valleys, alluviums prevail. Bay du Vin, Black River
Napan valleys, more especially the latter, contain land of excellent
ity, the upper portion of the soil partaking somewhat of a loamy
sistency. On the north side of the Miramichi estuary, from New-
le to Bartibogue, the coarser material of the surface deposits only
ns to be left upon the slopes, although immediately bordering the
st there are strips of good land. Further north, between Barti-
ue and Tabusintac, the coastal area is generally low and wet, but
tains some arable tracts. The back settlements here are, however,
ted upon good dry soil. Between Tabusintac and Tracadie a wide
ly plain occurs, mostly unsettled, but around the latter place and
t. Isidore, excellent tracts of farming land are found.

hippegan and Miscou Islands have but few settlers, and these devote
t of their time to fishing. The land is low, and most of it poor
wet.

eturning to the Miramichi River, we find many fine tracts of land
ipied and in a good state of cultivation upon the Middle and Lower
boniferous areas along the North-West and South-West branches.
slopes afford good drainage and the soil is deep and capable of
g raised to a high state of fertility by judicious and careful tillage.

Improvement of soil.

or the improvement of the soils overlying the Carboniferous area,
e appears to be the great *desideratum*. Considerable quantities of
re now applied in a slaked state. Near the coast of the Gulf and
g the estuaries, inexhaustible supplies of mussel-mud are obtain-
e, which contains a large percentage of lime and constitutes a
uable fertilizer. This material is, however, only used yet to a
ited extent.

Flora or sylva.

he flora of the district occupied by the Carboniferous rocks is
sely similar to that described in report M (Annual Report, 1886)
occurring in eastern Gloucester. the distribution of the species in

New growth since Miramichi fire of 1825.

certain localities being, however, somewhat different, especially wit
the area burnt over by the great Miramichi fire of 1825. Outside
that area, hemlock, black and white spruce, fir, black, white
yellow birch, maple, beech, poplar, white and red pine, etc.,
the principal trees on the drier grounds. On the swamps and int
vales, cedar, hacmatac (larch), ash, elm, balsam-poplar, etc., occ
There is, generally speaking, a heavy growth of wood, except wh
the original forest has been destroyed by fires. Within the a
overrun by the great Miramichi fire referred to, a growth of tr
has sprung up which is in some respects different from that
stroyed. Large groves of poplar on the damp grounds, and white bir
maple and beech on the drier, were especially noticeable, each of th
growing in spots to the almost entire exclusion of any other t
Upon the sandy and gravelly tracts, however, groves of red pine
black spruce are the prevailing forms, while along dry river ban
white spruce is the most abundant tree. The latter has attained, si
the fire, a thickness of 12 to 15 inches above the roots. Hacma
(larch) is common in bogs. The hemlock does not seem to have gro
again after its destruction. In general the young growth of tr
forms a dense forest.

Character of Soil upon the Cambro-Silurian Belts.

Soil of Cambro-Silurian area, quality of.

Of the two belts of Cambro-Silurian rocks crossing the district, t
adjoining the Carboniferous is the lowest and contains the best lar
Many parts of it are boulder-strewn, but along the Nepisiguit,
main North-West Miramichi and Big Sevogle (see Dr. Ells' repo
Reports of Progress, 1879-80 and 1880-81-82) there are some tra
containing excellent soil. North of the Nepisiguit, about the he
waters of Little and Pabineau rivers, there are also areas of fine la
well suited for agricultural purposes but still in a wilderness state.

Trees upon it.

On the north-western band of these rocks the land is higher and
pears to be more boulder-strewn. Both are still largely cove
with a heavy growth of birch, maple, beech, spruce, pine, etc. T
river valleys are generally pretty wide and contain flats with excell
soil.

The wide terraces along the Big Sevogle (see map) are clothed w
a dwarfed growth of red and Banksian pine 10 to 20 feet in heig
The flats support elms, poplars, etc. Strange to say, the last m
tioned trees, even within the limits of the great fire of 1825, seem
many places, to have escaped its ravages.

Soil upon the Pre-Cambrian Rocks.

Soil of Pre-Cambrian rocks, general sterility of.

Reference has already been made to the great amount of rock debris wn over the surface of that part of the country occupied by these ks, and its consequent general sterility noted. The mountain mits and flanks often exhibit little else than a mass of loose lders and coarse shingle, the result of ages of disintegration. ng the foot-hills and in the valleys, however, there are limited as of cultivable soil, while narrow intervales and terraces usually rt the rivers. A considerable part of this district has been overrun forest fires, and the covering of trees thus destroyed has never been laced. Isolated clumps still occupy the lower portions of the pes in places, however, and shroud the valleys and ravines.

Settlements, where located.

The settlements within the Miramichi district are chiefly confined the tracts bordering the coasts and estuaries. This is more pecially the case on the north side of the river, as on the south e, in addition to the coast settlements, there are a number of others ng the tributaries and behind the towns, as will appear on the p. Many of the latter are in a thriving condition, the general ricultural character of the country here being very good.

INDIAN ENCAMPMENTS.

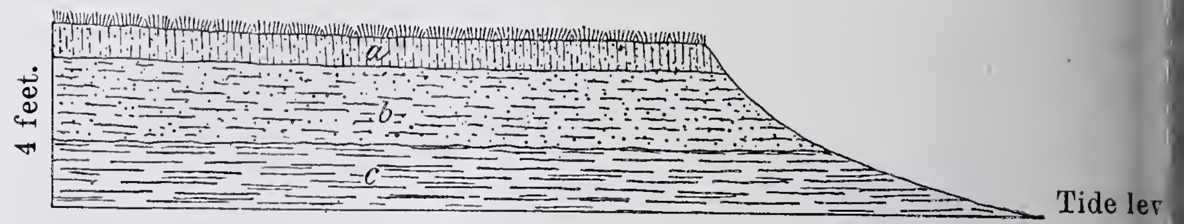
Indian camping grounds.

Old Indian camping grounds, in which flint arrow-heads, chips, bones d teeth of animals, etc., occur, were observed at the mouth of Tabu-tac River and on the banks of the South-West Miramichi a few miles ove Derby Junction. There seems to have been a burial ground in ar of the camp site at Tabusintac, human remains and a copper ttle having been found there.* A leaden crucifix, an iron hatchet, d other evidences of the intercourse of the early French settlers ith the Indians were also discovered. A number of the relics ere collected by Dr. A. C. Smith, of Newcastle, and Dr. Baxter, Chatham, and forwarded to the Natural History Society of New runswick and a paper relating to these pre-historic remains ap-eared in *Bulletin* No. V. of that Society. An examination of is Indian camp site during the past summer, in company with r. Smith, elicited the following facts:—The site of the encamp-ent is only three to five feet above high tide level, and the sea is ashing away the bank. Fig. 3 represents a geological section the beds—*a*, millstone grit; *b*, the same partially, and in the

Relics found.

---

* The human remains were supposed to be those of an Indian, and were buried three feet ep in the river's bank in rear of the camp-site.



a, Sandy loam. *b*, Rotted rock. *c*, Middle Carboniferous sandstone.
FIG. 3. SECTION AT INDIAN CAMP-SITE, TABUSINTAC RIVER.

upper part wholly, decomposed from subærial action; and *c*, a san loam apparently formed from the further oxidation of the underlyi gravel or sand and mingled with more or less recent sand thrown up the sea. Only in division *c* do the relics occur. Division *b* appears have been undisturbed, and there is no evidence of a submergen since the deposition of the Saxicava sands, (of which in reality *c* m form a part) or from the commencement of its occupancy by the I dians, as inferred by the writer of the article in the *Bulletin* just cit

How entombed.

The entombment of the relics in division *c* has been effected partl perhaps, by the *rejectamenta* of the Indians, but principally by atm pheric action and tillage, none appearing deeper in the soil than t plough could cover them. From the numerous stone chips, unfinish arrow-heads and others of more perfect form, as well as the reli showing contact with the early European settlers just referred to, seems probable that the Indians occupied this camp site continuous from a very early period until recently. About the year 1860 th are said to have left it never to return.

MATERIALS OF ECONOMIC IMPORTANCE.

Economic materials.

The materials of economic importance known to occur in this distri have been incidentally referred to in preceding pages, and are bric clay, fine sand, gravel suitable for roads, ballasting railways, etc., pe and bog iron-ore, the latter in small quantities.

Where found.

Brick-clay of marine formation (Leda clay) is found in great abu dance along the estuary of the Miramichi, and brick-kilns are in ope ation at Chatham, Newcastle and Nelson. The one at the last mentione place is the largest and the bricks manufactured there are reporte to be of excellent quality. Sand beds (Saxicava sand) occur in pro imity to these brick yards, affording supplies of sand suitable for bric and mortar. Both Saxicava and recent sands of the finest quality f the purposes mentioned are abundant almost everywhere along th coast of this district (see p. 26 N, this report,) for description of san dunes).

Gravel adapted for the purposes referred to was met with in the vicinity of Chatham, Douglastown, Newcastle, Bartibogue and numerous other localities.

Peat is abundant and of great thickness and excellent quality. Should this article ever be required for fuel in northern New Brunswick, or for any other purpose, there is here an almost inexhaustible supply. The particular localities where the larger peat bogs occur, together with brief descriptions of them, are found on pp. 22-25 N, (this report.)

Bog iron-ore was observed on the south side of Tracadie River in small quantities. It was also noted on the North-West Miramichi in the vicinity of Chaplin Island. Clay associated with it and coloured therefrom is, at the latter place, used as a red paint for the outside of buildings.